

Remarks

Status of claims

Without prejudice, the claims have been amended to more clearly recite the subject matter Applicants regard as the invention. Specifically, Claim 1 has been reorganized for clarity and amended to indicate that the grounding path is confined to a particular section of the die attached pad and extends from the at least one die, through the section, and to the circuit board. Support for this amendment can be found in ¶ 20 of the Application (“By separating the die attached pad 52 into sections by forming the aperture 65 in the die attach pad of the high dynamic range devices, the present invention provides means for reducing the length of the ground pads and confining the RF ground return current to specific parts of the circuit board. This improves the RF grounding characteristics of the high dynamic range devices”). In addition to this change, the claims have been amended to improve the consistency of the language used throughout.

Claim Objections

The Examiner objected to Claim 1, stating that the word “though” should be “through.” In reply, Applicants have amended Claim 1 in accordance with the Examiner’s suggestion.

Prior Art Rejections

The Examiner rejected Claims 1, 4-7, and 19 under 35 USC 103(a) as being unpatentable over *Mori* et al. (U.S. Patent No. 4,884,124). Specifically, the Examiner

states that “*Mori* teaches a leadframe including a die attached pad . . . at lease one die mounted on a section of the die attached pad such that substantiates the entire opposing second service is and made in contact with the die attach pad (Fig. 5), thereby forming a ground path from at least one die, through the section and to the circuit board . . .” The Examiner states further that “while *Mori* fails to teach that the leadframe is connected directly to a circuit board, it would have been obvious to one of ordinary in the art at the time of the invention to directly attach a leadframe to a circuit board because this is conventionally to which leadframes are bonded.”

In reply, Applicants respectfully submit that the Examiner mischaracterized *Mori* and that the claimed invention is patentably distinct over this reference.

***Mori* Does Not Disclose A Leadframe In Which Substantially The Entire Bottom Surface Of The Die Contacts The Die Attach Pad**

Applicants respectfully submit that the Examiner has mischaracterized *Mori* and that it fails to teach or suggest that the “die is mounted on a section of the die attach pad such that substantially the entire opposing second surface contacts the die attach pad” as claimed. This is an important structural element of the claimed invention as it facilitates a ground path between the die and the circuit board (discussed below in greater detail). *Mori*, however, is devoid of any teaching of such a configuration.

Not only does *Mori* fail to disclose such a configuration, but modifying *Mori* in such a way would (1) destroy the object of its invention, and (2) eliminate its preferred embodiment.

It is well established in U.S. patent law that there could be no motivation to modify a reference if that modification destroys the object of the invention of the reference. Here, *Mori* clearly indicates that having just a small portion of the die connected to the die attach pad is critical to the invention. Specifically, the Summary of Invention states that “[t]he top surface of the [die attach pad] has a bonding section which is smaller than the area of the bottom surface of the [die], and the [die] is bonded to this bonding section.” Col. 2, ll. 14-18. The Specification goes on to state that “[t]he surface area in which bonding takes place is limited to an appropriate size, and it is possible to prevent bending prior to encapsulation such as illustrated in Figure 3 which is due to the area of the bonding being too large”. Col. 3, ll. 29-36. In this respect, the Background section states that “[i]f the surface area of bonding is too large, as shown in Figure 3, the semi-conductor element in the base 5 may be subject to bending prior to encapsulation due to temperature variations.” Col. 1, ll. 42-44. Therefore, *Mori* makes clear that its invention relates to *minimizing* the contact between the die and the die attach pad. Modifying *Mori* such that substantially the entire bottom of die is mounted to the attach pad would *directly contravene* the object of its invention.

Not only would modifying the device of *Mori* destroy the object of the invention, but it would also eliminate a preferred embodiment of the invention. It is generally recognized in U.S. patent law that there can be no motivation to modify a reference if that modification would eliminate the preferred embodiment of the disclosure. Here, *Mori* indicates the preferred embodiment comprises a layer of resin

between the die and the die attach pad. For example, while referring to Fig. 7, the specification reads as follows:

When the semiconductor element 1 and the base 7 are encapsulated in the resin 2, the resin 2 fills the insides of the holes 7d in the base 7 and clings to the inner surfaces thereof. Furthermore, the holes 7d increase the smoothness of the flow of the molten resin 2 so that the resin 2 will completely fill the gap between the semiconductor element 1 and the base 7. As a result, the adhesion of the resin 2 to the base 7 is increased, and the two are rigidly connected together.

Col. 3, ll. 40-45. Modifying the device of *Mori* in accordance with the claimed invention would *necessarily* require eliminating the layer of resin between the semiconductor element 1 and the base 7, and thus forgoing the increased adhesion it purportedly provides. Such modification would therefore destroy a preferred embodiment of the device.

Therefore, since modifying the device of *Mori* to provide full contact between the die and the die attach pad would destroy (1) the object of the invention to minimize contact between the two, and (2) a preferred embodiment in which a layer of resin resides between the two, there can be no motivation to do so according to US patent law. The rejection should therefore be withdrawn and the claims allowed.

Mori Does Not Disclose A Chip Scale Package In Which The Ground Path Is Confined To A Section Of The Die Attach Pad

An important feature of the claimed invention is *confining* the ground path to the section of the die attach pad to which the die is connected. Specifically, as set forth in the specification:

By separating the die attach pad 52 into sections by forming the aperture 65 in the die attach pad of the dynamic of the high dynamic range devices, the present invention provides means reducing the length of the ground paths and confining the RF ground turn currents to specific parts of the circuit board. This improves the RF grounding characteristics of the high dynamic range devices.

Appln. ¶20. Therefore, the chip scale package of the claimed invention provides a short, contained grounding path which is particularly important in RF applications.

Mori, on the other hand, fails to disclose such a configuration. To the contrary, *Mori* discloses a “plug in” type device wherein the die attach pad is completely surrounded by the mold compound and thus does not come in contact with the circuit board. Since the die attach pad never makes direct contact with the printed circuit board, there is no ground path from the die through a section of the die attach pad and into the circuit board. Rather, the ground path for *Mori* is *necessarily* through the bond wires and *not* confined to a section of the die attach pad.

Although the Examiner stated that “while *Mori* fails to teach that the leadframe is connected directly to a circuit board, it would have been obvious to one of ordinary in the art at the time of the invention to directly attach a leadframe to a circuit board because this is conventionally to which leadframes are bonded,” such a conclusion flies in the face of established US patent law. That is, such a conclusion ignores the fact that there is no motivation to modify *Mori* such that the bottom of the die attach pad mounts to a circuit board to provide a ground path which is contained to the section of the pad to which the die is attached. *To the contrary*, the configuration of the mold compound around the die attach pad is an important design parameter of the *Mori* device and eliminating it would destroy the principle of operation of *Mori*. It is well established in U.S. Patent Law that there could be no

motivation to modify a reference if that modification would undermine the principle of operation disclosed in the reference.

Here, *Mori* uses mold compound on either side of the die attach base to “stabilize” the leadframe and prevent bending. Specifically, *Mori* states as follows:

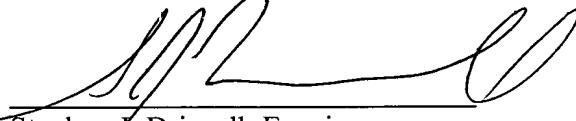
Since the coefficients of thermal expansion of the resin 2 and the copper alloy 7 are similar, if T1 (the thickness of the resin 2 above the semi conductor element 1) is approximately equal to T3 (the thickness of the resin 2 below it), with the increased adhesion between the resin 2 and the base 7, the thermal expansion of each portion of the device will balance, thereby suppressing the bending of the device due to temperature variations subsequent to encapsulation, and bending damage could be prevented.

Col. 3, ll. 45-54. Eliminating the mold compound below the die attachment pad to facilitate direct attachment of the die attachment pad to the circuit board would eliminate also its counterbalancing effect. In other words, the balance between the T1 layer and the T3 layer would be destroyed if the T3 layer is eliminated. Therefore, since modifying the leadframe of *Mori* to mount directly to a circuit board in accordance with the claimed invention would destroy the principle of operation of *Mori*, there could be no motivation to do so. Accordingly, the rejection should be withdrawn and the claims allowed.

U.S. Patent Application No. 09/966,222
Attorney Docket No. 17658
Page 12

In light of the above remarks, an early and favorable response is earnestly
requested.

Respectfully submitted,



Stephen J. Driscoll, Esquire
Registration No. 37,564
Attorney for Applicant
The Whitaker Corporation
4550 New Linden Hill Road
Suite 140
Wilmington, DE 19808
Telephone: (215) 923-4466
Facsimile: (302) 633-2776

SJD/dl

M:\sdriscoll\whitaker\24989-A USA\response to OA dated 6-1-05.doc